March 2021

USE OF DRONES FOR VEHICLES INVOLVED IN ACCIDENTS

Axel Unger
Bertrandt Ingenieurbüro GmbH

USE OF DRONES FOR VEHICLES INVOLVED IN ACCIDENTS

Technical task:
In order to avoid possible discrepancies in the eCall data set and to enable a better and easier localization of the crashed vehicle, the use of a drone is proposed in this present idea description.

When the crashed vehicle is stationary, an emergency drone attached to the vehicle is activated and positions itself exactly above the crashed vehicle with a fixed position (for example, 30 meters above the vehicle). The drone can then provide the following added value:

- More accurate determination of geo-position (satellite shadowing generally decreases with altitude).
- Aerial photography of the accident site and the people involved in the accident
- Estimation of accident severity
- Estimation of the number of people involved in the accident
- Light signal for rescue services in the field of view (comparable to the use of a signal gun)
- Provision of illumination of the accident scene

The drone can transmit the determined information as an additional data set to the rescue center.

Initial situation:
Nowadays, modern vehicles are equipped with so-called eCall systems, which trigger an automatic emergency call in case of special trigger conditions (e.g. deployment of an airbag, rollover, etc.). Manual triggering of an emergency call by a vehicle occupant is also possible via an emergency call button in the vehicle.
When an eCall emergency call is triggered, a data record is transmitted to a rescue control center, consisting, among other things, of the time, geo-coordinates of the vehicle and direction of travel. This data is read from the state of the vehicle.

Disadvantage:
Using vehicle data alone as the source for the transmitted data set can result in inaccuracies or incorrect information being transmitted. For example, the geo-position at the time of the accident may be inadequately determined, i.e. the indicated geo-position of the vehicle in the eCall data set deviates significantly from the actual position. These deviations can occur, for example, due to satellite shadowing.
Furthermore, a deviation of the indicated driving direction is conceivable if the vehicle comes to a standstill on the opposite lane during the accident.

Solution:

Shoring and connectivity to the vehicle

- Installation of the drone on the vehicle (e.g. in the underbody) with a mechanism for releasing the drone by the vehicle or the drone itself.
- Connection of the drone to the vehicle bus system
    - Transmission of the accident trigger (e.g., airbag deployment, rollover) from the vehicle to the drone; simultaneous triggering of the first eCall by the vehicle itself remains (=previous state of the art)

Mode of operation in the event of an accident

1. sending of the eCall to the rescue center by the vehicle (as before; state of the art)
2. sending of the accident trigger to the drone
3. drone starts measuring the accident situation (e.g. with acceleration and gyro sensors)
4. drone is detached from the vehicle / detaches itself from the vehicle as soon as no more movement of the vehicle can be measured (means standstill of the vehicle and final vehicle accident position)
5. drone moves to a hovering standstill position above the vehicle (see fig. 1)
6. drone determines exact geo-position
7. drone creates accident image from the air
8. drone determines estimated values (e.g. accident severity, accident participants)
9. drone transmits extended eCall data set to rescue control center
10. drone activates light signal for rescue services
11. drone activates illumination of the accident site

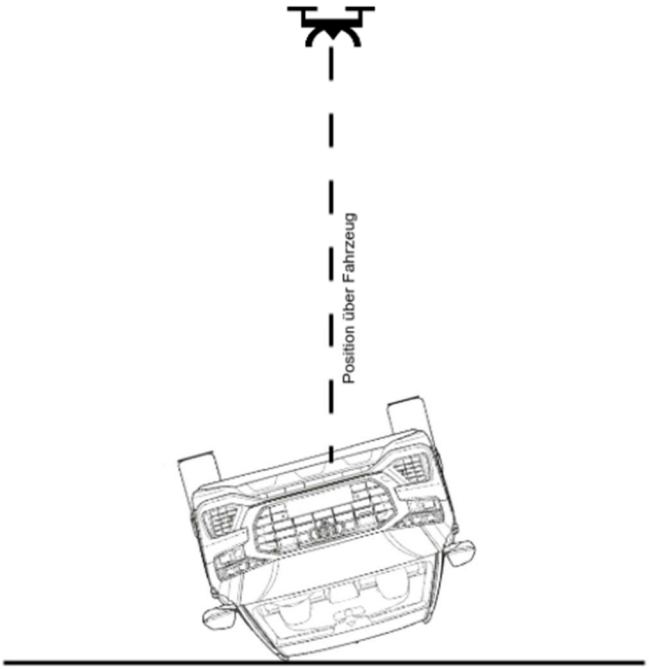

Figure 1: Position of the drone above the crashed vehicle.

Advantages:
Using a drone with the aforementioned capabilities results in the following advantages:

- More accurate indication of geo-position even with poor satellite reception
- Better planning of the rescue operation due to the availability of aerial photographs of the accident site, estimation of accident severity and estimation of accident participants
- Better locating of the vehicle involved in the accident on the spot due to the light signal (e.g. in case of leaving the lane)